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PLANTS FOR THE WEST

Plant Materials for Fall and Winter Forage

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Forage Availability – Challenges?

April – early June **-** Transition period between winter grazing pastures and summer pastures .. forage quality is critical because of possible calving.

September – October - Transition period between summer grazing and winter pastures.

November – March **-** Maintenance period through the winter - generally less productive land used.

Why - Fall and Winter Forage?

Simonds (1990) concluded that hay costs accounted for 70% of the total livestock costs.

Waldron et al. (2006) reported that grazing was more economical, costing $0.24·cow^{-1}·d^{-1} less than feeding alfalfa hay in drylot.

Challenge – Forage Quality?

Literature reports that
a CP level of
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(Turner & I
1985,

FORAGE AND RANGE RESEARCH LABORATORY

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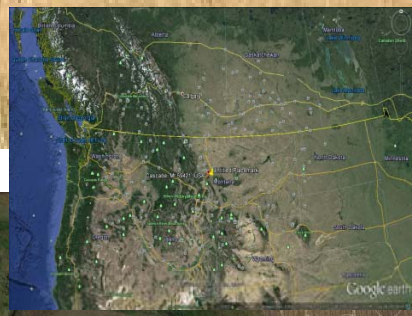
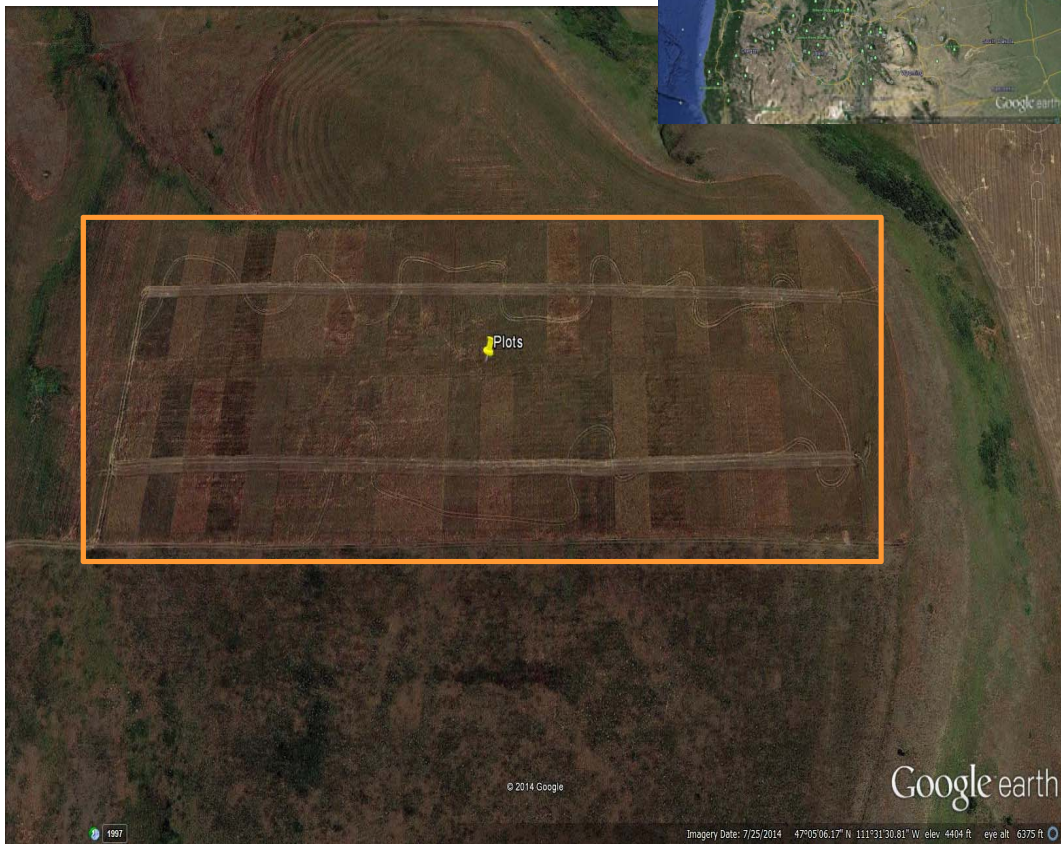
Winter – Forage Study



Sieben Land and Livestock – Cascade, MT

Questions:

- Graze in May (lightly) and then return in the winter?
- Identify species & mixes with increased forage DMY and nutritional quality during the winter.
- Can species and mixtures withstand intensive short duration grazing?



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Seiben Study – Plot Layout

➢ Plant Materials/Field Design:

Treatment 1 = Meadow brome (15 lbs)

Treatment 2 = Intermediate wheatgrass (15 lbs)

Treatment 3 = Tall fescue (12 lbs)

Treatment 4 = Crested wheatgrass (12 lbs)

Treatment 5 = Orchardgrass (12 lbs)

Treatment 6 = Meadow brome (7 lbs) + Intermediate WG (7 lbs) + Alfalfa (2 lbs)

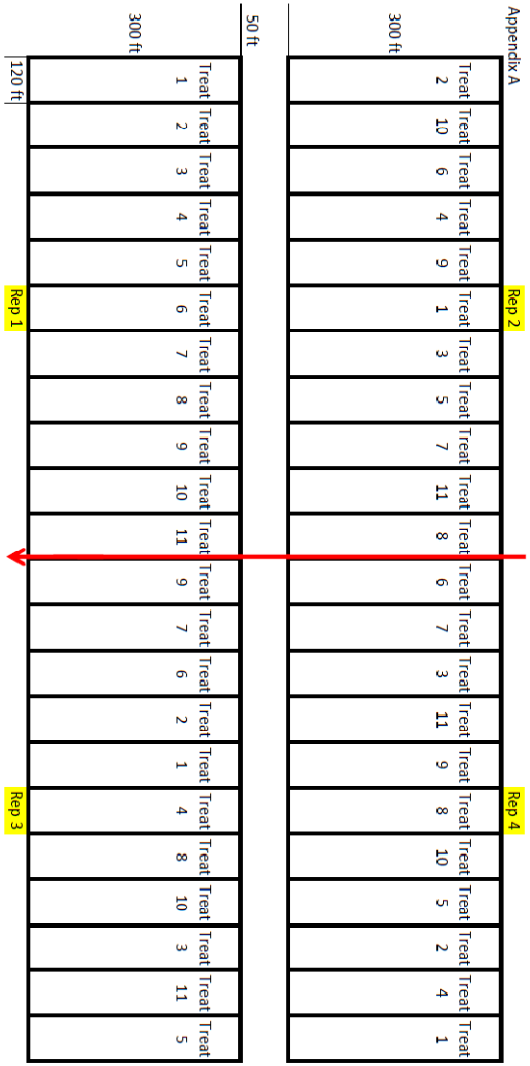
Treatment 7 = Meadow brome (7 lbs) + Intermediate WG (7 lbs) + Sanfoin (3 lbs)

Treatment 8 = Meadow brome (7 lbs) + Intermediate WG (7 lbs) + Small Burnet (2 lbs)

Treatment 9 = Meadow brome (7 lbs) + tall fescue (5 lbs) + Alfalfa (2 lbs)

Treatment 10 = Meadow brome (7 lbs) + tall fescue (5 lbs) + Sanfoin (3 lbs)

Treatment 11 = Orchardgrass (12 lbs) + Alfalfa (2lbs)



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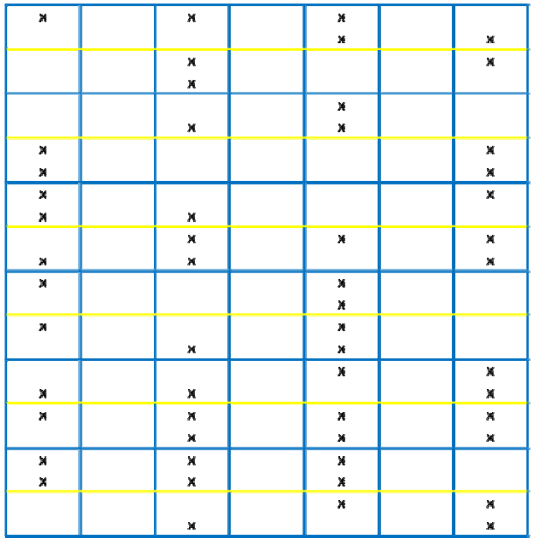
Treatments - Data

Plant establishment

- **Seedling Frequency**



- **Seedling counts (legumes)**

Plant - Establishment

November - March – Sieben Land and Livestock Study

Sig.		Percent Grass Establishment	Entries
	A	99.750	Orchardgrass
B	A	97.000	OG_Alfalfa
B	A	93.667	Intermediate_WG
B	C	90.000	MB_IWG_Alfalfa
B	C	89.750	MB_IWG_Sanfoin
B	C	89.750	MB_TF_Alfalfa
B	C	89.500	MB_IWG_Small_burnet
B	C	89.250	MB_TF_Sanfoin
B	C	89.250	Tall_fescue
B	C	88.250	Meadow_brome
	C	82.000	Crested_WG

November 2013

Legume - Persistence

Treatments - Data

- Dry-matter yield (Fall – November)

- Forage nutritional characteristics (Just prior to winter grazing)
- Grazing
  - ✓2015 – Feb (1009 – cows)
  - ✓2016 – April (1117 – cows)
  - ✓2017 – Early graze – (962 cows)

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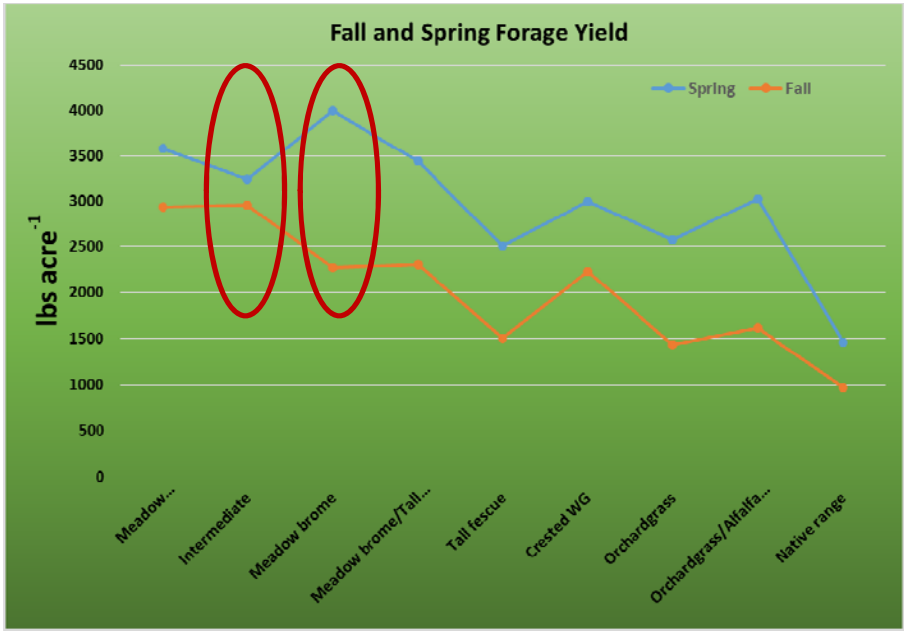
Spring Yields – lbs acre^{-1} 2014-17



Seed Mix	June Spring DM lbs acre^{-1} (2014-17)	
Meadow brome/Intermediate WG	3575	ab
MB-Int_small burnet	3429	abc
MB_Int_alfalfa	3724	ab
MB_Int_sainfoin	3572	abc
Intermediate	3241	bc
Meadow brome	3995	a
Meadow brome/Tall fescue	3441	bc
MB_TF_sainfoin	3410	abc
MB_TF_alfalfa	3473	abc
Tall fescue	2510	d
Crested WG	2998	cd
Orchardgrass	2579	d
Orchardgrass/Alfalfa (control)	3024	cd
Native range	1459	e

24%

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Fall Yields – lbs acre^{-1} 2014-17

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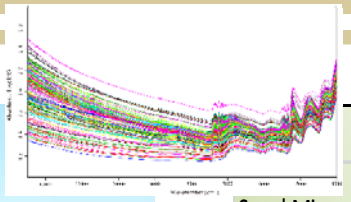
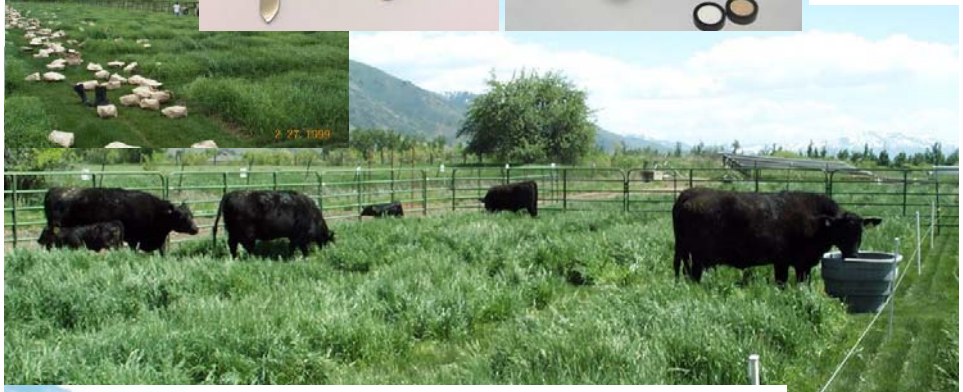
Spring Quality – 2014-17








	June				
Seed Mix	% CP	% NDF	% dNDF48	% WSC	RFQ
Meadow brome/Intermediate WG	15.1	57	33	8.6	121
MB-Int_small burnet	14.6	56	33	9.1	121
MB_Int_alfalfa	16.3	56	32	8.3	113
MB_Int_sainfoin	14.1	58	34	8.6	115
Intermediate	15.1	57	33	9.6	121
Meadow brome	13.4	56	33	9.5	123
Meadow brome/Tall fescue	14.4	56	32	9.0	116
MB_TF_sainfoin	13.9	57	32	8.6	116
MB_TF_alfalfa	14.9	55	32	9.4	122
Tall fescue	14.5	55	30	11.5	117
Crested WG	13.1	58	33	12.8	126
Orchardgrass	13.5	56	35	10.4	128
Orchardgrass/Alfalfa (control)	12.8	56	34	11.1	125
Native range	11.8	60	25	7.8	100
LSD $_{(0.05)}$	1.9	3	2	1.5	10

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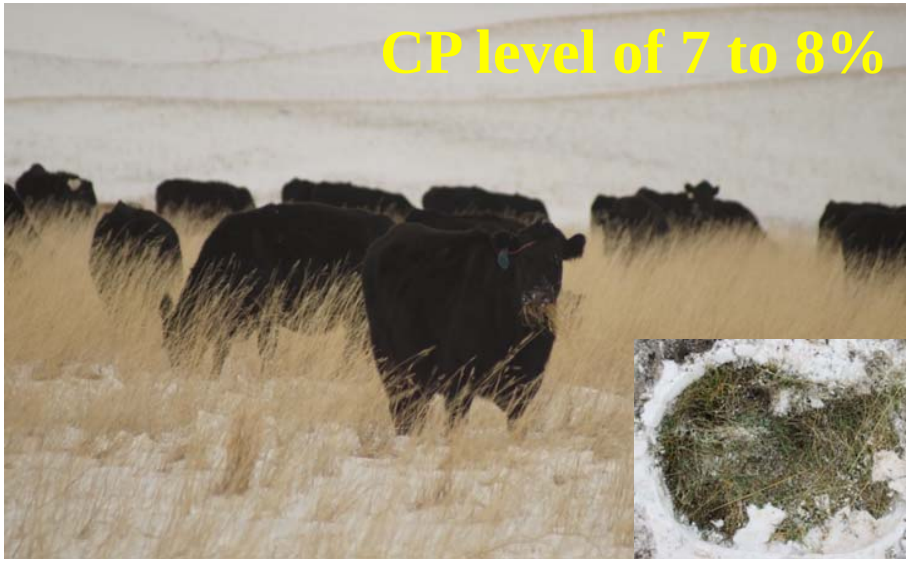
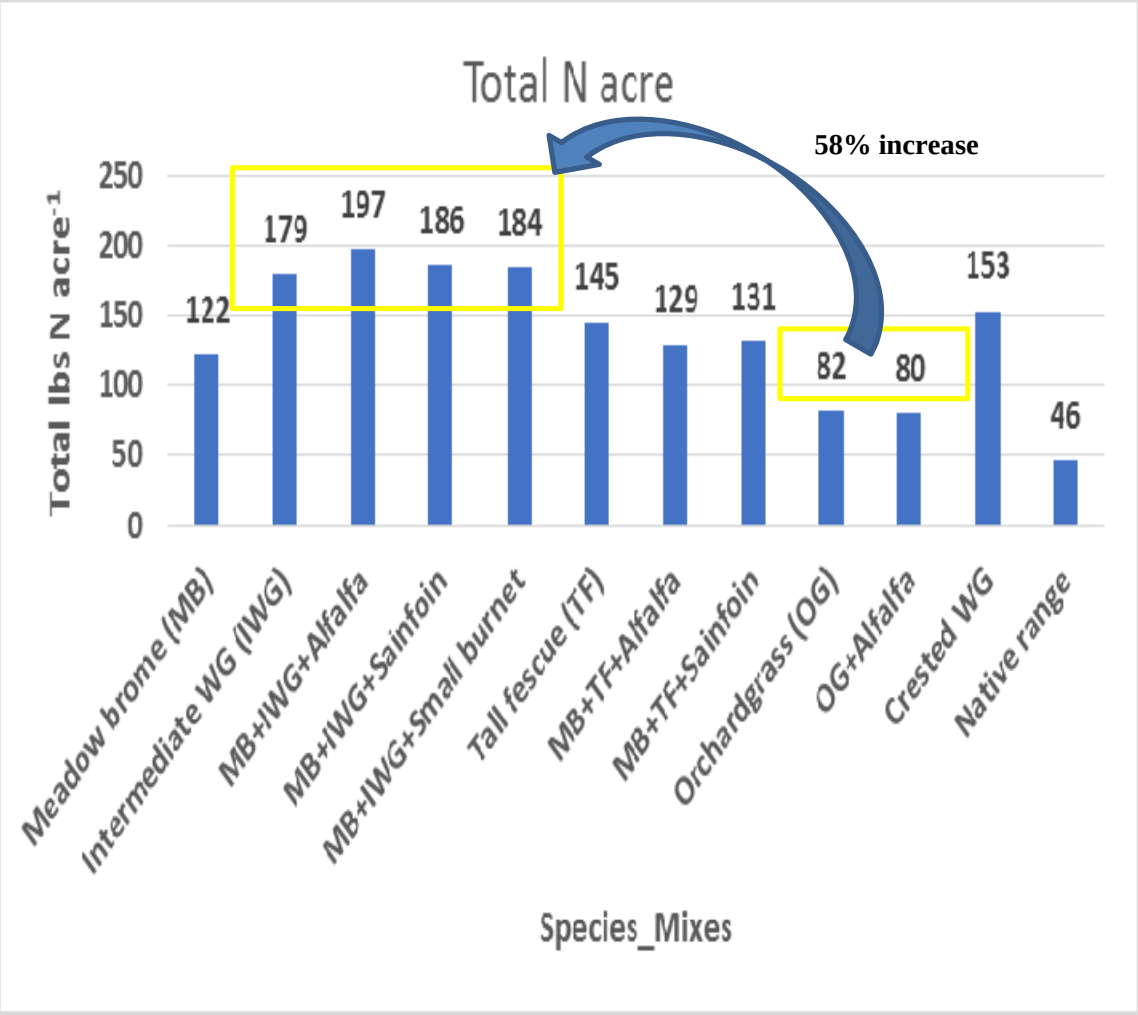
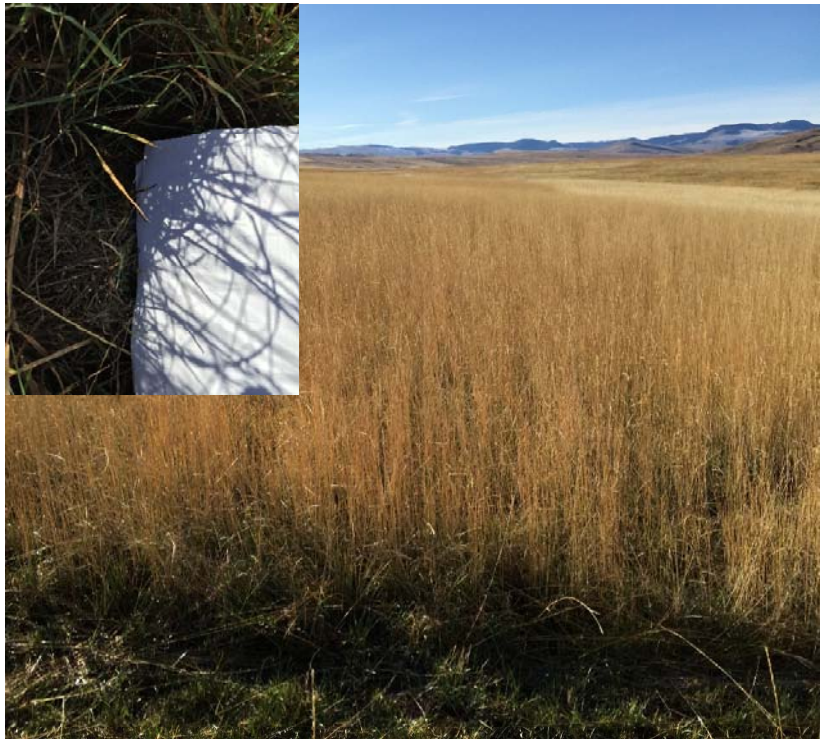
Winter Quality – 2014-17



	Winter forage quality				
Seed Mix	% CP	% NDF	% dNDF48	% WSC	RFQ
Meadow brome/Intermediate WG	6.5	80	35	0.9	43
MB-Int_small burnet	5.6	82	36	0.8	38
MB_Int_alfalfa	7.5	81	35	1.3	48
MB_Int_sainfoin	6.3	79	32	0.7	44
Intermediate	7.0	79	35	1.8	53
Meadow brome	6.1	82	32	0.0	31
Meadow brome/Tall fescue	7.1	80	33	0.6	35
MB_TF_sainfoin	7.1	80	32	0.5	36
MB_TF_alfalfa	7.0	81	34	0.8	34
Tall fescue	8.3	76	38	3.7	54
Crested WG	6.0	81	31	1.5	44
Orchardgrass	7.0	76	39	1.8	61
Orchardgrass/Alfalfa (control)	6.9	77	42	2.6	58
Native range	5.3	80	33	1.5	48
LSD $_{(0.05)}$	2.1	4.1	4.0	1.4	14

What does increased yield mean?





- **Even at 50% utilization – increased yield more than offsets higher % of CP**

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Estimated stocking rates

Economic Framework

- NPV= Present Value of Benefits minus Present Value of Costs
- Key Components
  - Establishment Costs-$94.54/acre-assuming 1,000 acres
    - Includes tractor, planter, labor, seed, and fixed (ownership) costs
  - Benefits are derived from costs savings-increased feed=less purchased feed
    - Assuming $1,000 head, annual benefits = $59,800
  - 10 year time period
  - *Internal Rate of Return = 63%*

Questions

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Meadow Brome – Characteristics

Adaptation

- Moderate rhizome development
- Early spring growth (earlier-smooth brome)
- High forage yields
- Adapted to dryland conditions (15 inches precipitation)
- Recovers quickly after cutting
- Stands are easy to establish
- Winter hardy

Limitations

- Highly pubescent
- Very sensitive to spring flooding
- Early maturing

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Meadow bromegrass – 'Cache'

Entry	IN Total Yield	KY Total Yield	VA Total Yield	10-cut Total	% Mean
CACHE	**6.96**	**2.28**	**2.01**	**11.25**	**106.3**
FLEET	5.70	2.96	1.94	10.60	100.2
MACBETH	5.97	1.44	2.44	9.85	93.1
MB1301	5.37	2.31	2.30	9.98	94.3
MB1302	6.11	2.13	2.53	10.77	101.8
MB1303	6.06	2.58	2.23	10.87	102.7
MB1304	5.72	2.28	2.35	10.35	97.8
FRRL-MB-HP	5.28	1.57	1.96	8.81	83.3
FRRL-MB-HIYIEL	5.65	2.64	2.29	10.58	100.0
FFRL-MB-SALT	5.22	2.01	2.23	9.46	89.4
CV(%)	9.64	26.47	15.96		
Test Mean	5.81	2.34	2.44	10.58	
LSD.05	1.15	1.27	0.80		

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Meadow bromegrass – ‘Cache’

Intermediate wheatgrass

Intermediate wheatgrass

- Moderate sod forming, late maturing, persistent
- Adapted to fertile soils that receive 14 to 18 inches of
- Tolerant to moderately alkaline soils
- The pubescent form Luna is better adapted to lower precipitation zones

Intermediate wheatgrass – Nutritional Quality

Spring Traits:

- 360 lbs ac^{-1} (May – dryland)
- CP 14.1%; Digestibility 85%;
- NDF 51.2%

Regrowth Traits - November:

- 439 lbs ac^{-1}
- CP 11.4%; Digestibility 75%;
- NDF 57.1%

Fall Traits:

- 840 lbs ac^{-1} (Oct. - stockpiled)
- CP 9.7%; Digestibility 73%;
- NDF 60.3%

Adapted cultivars: Oahe (14% greater than Luna), Rush, Greenar

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Intermediate wheatgrass – Yield

Means and trends in dry-matter yield (DMY) of 13 grass species across five years at Beaver, UT from 2010 to 2012.

	DMY		
Species	2010	2011	2012
Intermediate WG	1812 **A**	933 **AB**	792 **A**
Snake River WG	901 BC	666 BCD	303 DEF
Crested WG	896 B	730 B	522 ABCD
Russian WR	872 BC	638 BCD	569 ABC
Thickspike WG	699 BCD	384 F	503 BCD
Bluebunch WG	698 BCD	631 BCDE	579 ABC
Basin WR	656 CDE	972 A	561 ABC
Western WG	600 DE	705 BC	683 AB
Indian ricegrass	563 DE	470 DEF	280 EF
Smooth bromegrass	561 DE	838 AB	544 ABCDE
Siberian WG	557 DE	496 CDEF	403 CDEF
Slender WG	521 DE	110 G	198 F
Bottlebrush ST	440 E	396 EF	500 BCDE

Dry matter yields of intermediate wg cultivars at Central Research Ext. Center. Mandan, ND

4,743 lbs acre

Cultivars	1991	1992	1993	1994	1996	5-yr Average	Relative yield
		lb acre^{-1}					%
Reliant	4542	8000	7576	4340	2377	5367	100
Manska	3218	6549	5600	2870	1808	4009	75
Mandan-759	3762	7224	6035	3767	2078	4573	85
Oahe	4248	7937	6982	3181	2150	4900	91
Slate	3666	7038	5798	3921	2118	4508	84
Greenleaf	2841	6043	5831	3243	1839	3959	74
Chief	3650	6909	5486	2620	1784	4090	76
Clarke	4249	7786	4670	3255	1862	4364	81
Average	3772	7186	5997	3400	2002	4471	
5% lsd	651	777	1666	1056	462	624	

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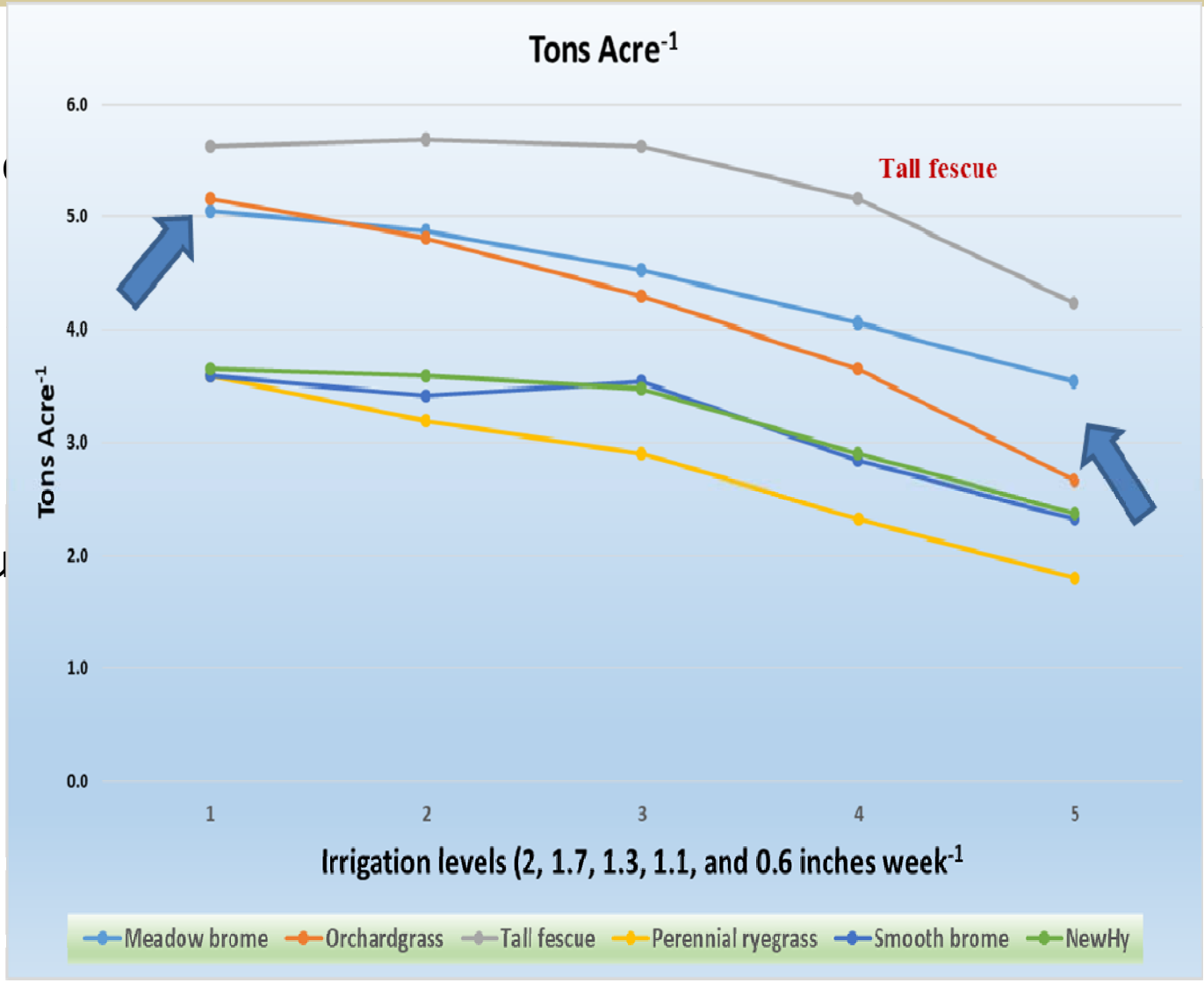
Tall Fescue



Orchardgrass

Adaptations

- **Medium to long-lived, high forage producing bunchgrass adapted to well drained soils.**
- **Widely preferred species for hay, pasture, or silage for livestock and wildlife.**
- **It can be grown under irrigation or dryland where at least 18 inches of annual precipitation are received.**

Later maturing type -- has higher digestibility and protein than early maturing types.

Medium maturing type -- 'Paiute' not more drought tolerant.

Early maturing type – 'Ambassador', 'Dawn', and 'Potomic' -- known for improved seedling vigor, high yielding, and rapid recovery after grazing.

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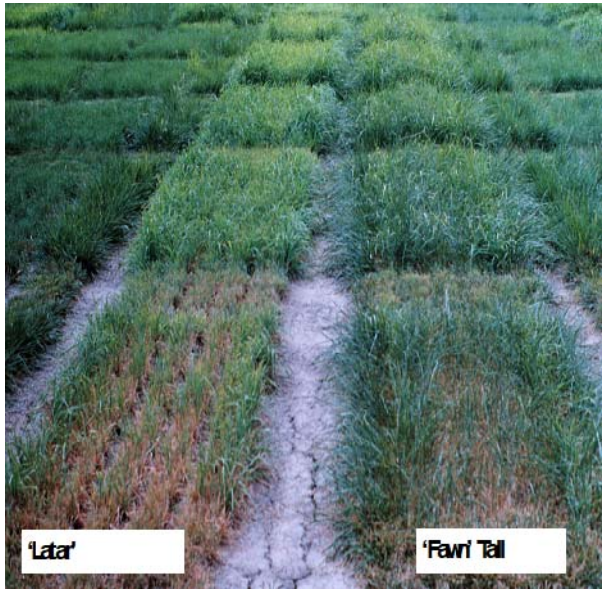
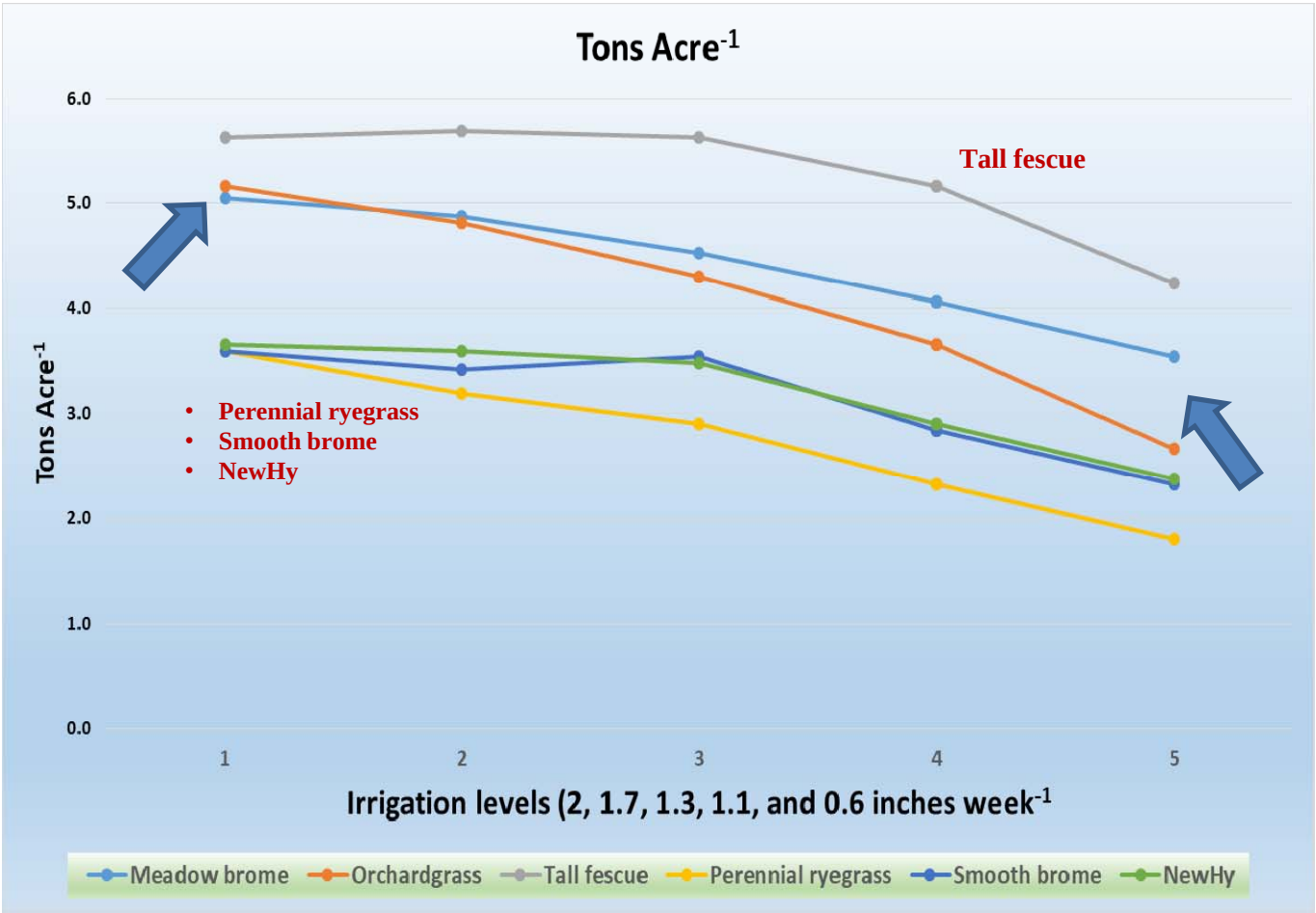
Orchardgrass response to irrigation





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Orchardgrass Improvement

- Germplasm from China
- Late maturing
- Exceptional nutritional quality
- Poor seed production

Released UTDG-101 germplasm

Crested/Siberian wheatgrass – Nutritional Quality

Spring Traits:

- 849 lbs ac^{-1} (May – dryland)
- CP 12.6%; Digestibility 81%;
- NDF 54.7%

Regrowth Traits - October:

- 255 lbs ac^{-1}
- CP 15.6%; Digestibility 83%;
- NDF 54%

Fall Traits:

- 974 lbs ac^{-1} (Oct. - stockpiled)
- CP 9.0%; Digestibility 69%;
- NDF 61.9%

Adapted cultivars: Hycrest II, Vavilov II, and Nordan

Winter Forage Study – Cheyenne, WY

Small burnet (*Sanquisorba minor*)

- Evergreen
  - Stays green through dry summer periods
  - Stays green and continues to grow until snow fall
- Highly palatable
  - Readily grazed by livestock and wildlife
  - Utilized by upland game
- Easy to establish
  - 12 to 20 inch precip
- Maintains forage quality through late fall and into winter

Noticed Deer grazing the day prior to picture taken.

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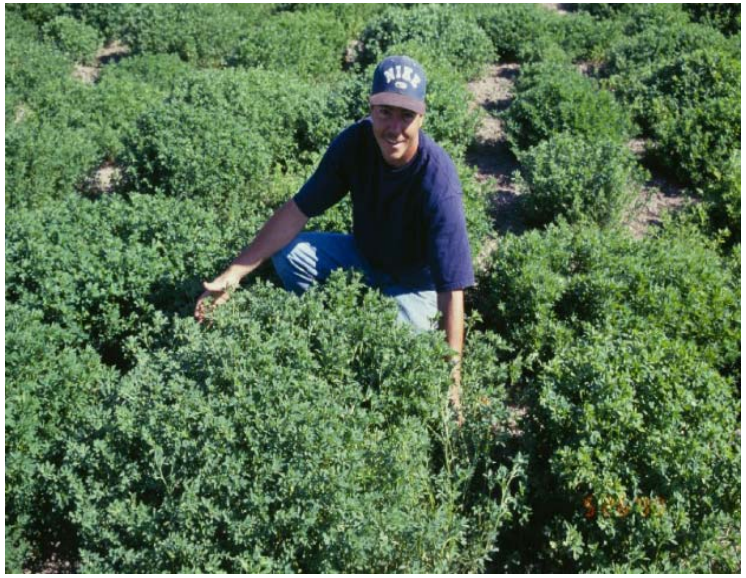
Sainfoin

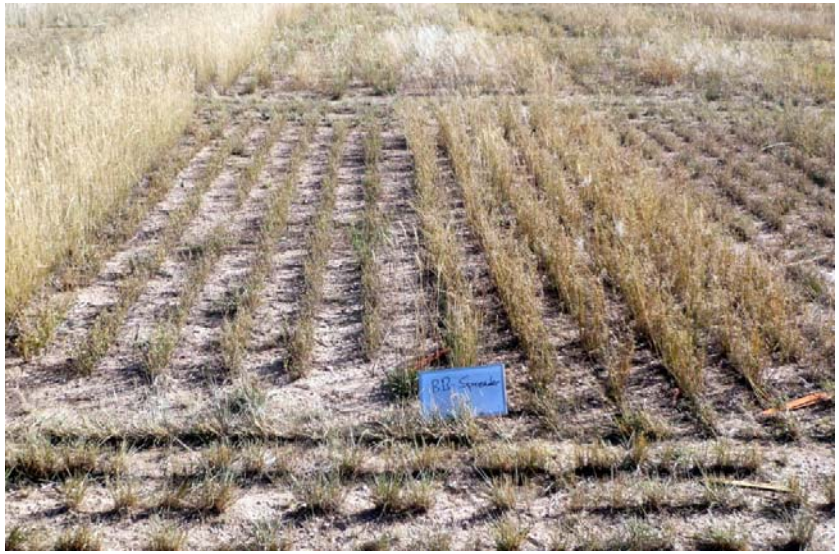
- General characteristics
  - Non bloater
  - Resistant to alfalfa weevil
  - Good quality
- Breeding objectives
  - Persistence under grazing
  - Resistance to root diseases
  - Productivity of forage and seed
  - Seedling vigor

An ideal plant type is one that you can barely get your arms around to hug and tastes good (Kay Asay)

Alfalfa (*M. sativa*) – BB spreader

Broad spreading crown





Questions